

Arizona Department of Public Safety

Firearms Training Unit

Report on the testing of Striker-Fired handguns 2014

Summary:

The testing of striker-fired weapons is intended to make two determinations. First; are any of the test weapons suitable for officers to personally purchase and carry as a primary handgun. Second; are any of the weapons a better choice for the Department to purchase as a primary handgun. The first phase of testing specifically addresses whether testing should continue with any of the weapons, or if our current handguns are clearly superior and further testing is therefore unnecessary. The second phase will determine whether any of the weapons is an acceptable personal purchase option. If any of the weapons are deemed viable after the second phase, the third phase will determine which, if any, of the weapons should be purchased by the agency. These weapons are all less costly than our current weapons and a change would not incur any additional cost to the Department.

Weapons tested:

All of the weapons tested share several common characteristics. These weapons represent the available models from major manufacturers that meet the criteria below.

1) Firing System

Each weapon tested was striker-fired. This trigger system has the same trigger pull length and weight with each shot. A consistent trigger pull offers training advantages over a double action to single action transition. This system is generally contained primarily in the slide which allows the grip to be placed higher, or closer to the axis of the bore, which helps reduce muzzle rise and perceived recoil. Hammer fired weapons such as our current Sig Sauer handgun require the hammer to be hinged in the frame which forces the grip to be below the hammer and farther away from the axis of the bore.

2) Barrel Length

On our current weapons, the weapon mounted flashlight is the longest portion of the weapon. The holster has to be long enough to contain the flashlight regardless of the length of the barrel. A five inch barrel comes to the end of the flashlight. So the weapon and its holster are effectively the same length whether the weapon has a three inch barrel or a five inch barrel. For this reason, a five inch barrel makes more sense. The additional sight radius helps the shooter be more accurate. The longer barrel generates slightly more muzzle velocity and energy as the powder has more time to expand in the chamber and barrel accelerating the bullet over a longer distance. The additional slide length helps reduce muzzle rise.

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3) Caliber

The caliber currently used by the department is the 40 S&W. The current trend in law enforcement is to the 9mm parabellum. The weapons selected are all available in both calibers, although this test focuses primarily on the 40 S&W.

4) Manufacturer support

The availability of weapons, parts and service are crucial to a law enforcement agency. The manufacturers selected represent all major manufacturers with a weapon meeting the criteria. The customer support of these manufacturers is currently being researched and the information obtained will apply if any of the weapons is desirable for department purchase. Therefore, this information will be documented in the third and final phase report.

5) Design and Ergonomics

The department is staffed with people of different builds. Each of these test weapons offers a grip component that can be easily changed to fit the weapon to the shooter's hand. This feature helps the shooter control the weapon, which offers advantages in accuracy, speed, and weapon retention.

The following weapons were selected to be tested based on the criteria above:

1) Sig Sauer P320

Sig Sauer is a German company that has been manufacturing weapons for military, law enforcement and civilian markets since 1972. Sig is the manufacturer of our current duty handguns, the P226 and the P229. The P320 is a striker-fired handgun with interchangeable polymer frames of different sizes. It only comes with the standard grip, but additional grip frames can be bought for about \$45. It has a 4 $\frac{3}{4}$ " barrel and a 7.5 pound trigger pull. It utilizes metal magazines that hold 14 rounds each. It is manufactured in Germany.

2) FN (Fabrique Nationale) FNS 40 L

Fabrique Nationale, or FN, is a Belgian company that has been manufacturing weapons for military, law enforcement and civilian markets since 1889. FN currently has several US military contracts including the M249, M240, and M4 rifles. The FNS 40 is currently in use by other large law enforcement agencies around the country. It is a striker-fired, polymer framed handgun. It includes 2 interchangeable back straps to fit the weapon to the shooter's hand. It has a 5" barrel and a 6.25 pound trigger pull. It utilizes metal magazines that hold 14 rounds each. It is manufactured in the USA. The FNS is fully ambidextrous, so no changes to the magazine release or slide stop are necessary to accommodate left or right handed shooters.

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3) Glock 35

Glock is an Austrian company that has been manufacturing weapons for military, law enforcement and civilian markets since 1980. Glock handguns are the most commonly used handgun in law enforcement. The Glock 35 is a striker fired, polymer framed handgun with a 5.3" barrel. It comes with three sizes of back straps to fit the handgun to the shooter's hand. It has a 6.25 pound trigger pull. It utilizes polymer clad magazines that hold 15 rounds each. It is manufactured in Austria.

4) Smith & Wesson M&P 40L

Smith & Wesson is an American Company that has been manufacturing weapons for military, law enforcement and civilian markets since 1852. The M&P line of handguns are in use by several large law enforcement agencies in the US. It is a striker fired handgun with a polymer frame and a 5" barrel. It comes with three grip inserts that change the size and shape of the back strap and the palm swells to help fit the weapon to the shooter's hand. It has a 6.5 pound trigger pull. It utilizes metal magazines that hold 15 rounds each. It is manufactured in the USA.

5) Springfield Armory XDM 5.25

Springfield Armory Inc. is an American company that has been manufacturing weapons for law enforcement and civilian markets since 1974. This company purchased the rights to use the name of the historical US military contractor "Springfield Armory" but is not otherwise associated with that company. The XDM is in use by several law enforcement agencies in the US. It is a striker fired handgun with a polymer frame and a 5.25" barrel. It comes with three back straps to fit the grip to the shooter's hand. It has a 5.5 pound trigger pull. It utilizes metal magazines that hold 16 rounds each. It is manufactured in Croatia. Unlike the other test weapons the XDM features a grip safety that must be depressed to fire the weapon.

The following sections of this report will document the results of the three separate phases of testing.

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Firearms Training Unit

Report on the testing of Striker-Fired handguns Phase 1 test results

Summary:

The first phase of testing specifically addresses whether testing should continue with any of the weapons, or if our current handguns are clearly superior and further testing is therefore unnecessary.

Testing Procedures:

This phase of the testing was conducted utilizing one example of each weapon. Each handgun was purchased new, no manufacturer supplied demos or samples were used. Each of the test weapons were subjected to the following protocols, as were a new Sig Sauer P226 and P229.

- 1) Each handgun was cleaned to remove any packing grease applied by the manufacturer.
- 2) A 250 round "break-in" was conducted with each of the weapons. Accuracy and reliability was not measured during this time period.
- 3) The weapons were then properly cleaned and lubricated.

(Any malfunctions either mechanical or user-induced were documented after this point)

- 4) Tests of Accuracy were conducted. The goal of measuring accuracy was not to determine which weapon was the most accurate, but to confirm whether or not the weapon was acceptably accurate. We first attempted to use a Ransom rest for this portion, but found that the rest itself allowed too much movement between shots. Furthermore the stress of clamping the weapons into the rest had the potential to induce malfunctions. Instead, the accuracy was measured by accomplished shooters firing several groups from a rested position. The average of those groups was documented.
- 5) Muzzle velocity was measured using a Competition Electronics Pro-Chrono. Each weapon fired five rounds of Speer Gold Dot ammunition through the chronograph. An average velocity was calculated and documented for each weapon.
- 6) Range testing was conducted. Side by side comparisons were made by 20 employees who are skilled and knowledgeable in the area of firearms. They included firearms instructors from central, northern, and southern Arizona. Their assignments represented the Director's Office, Highway Patrol, Criminal Investigations, SWAT, and Commercial Vehicle Enforcement. They were asked to put aside any preconceived opinions about the weapons to be tested. Each subject was asked to shoot the same number of rounds through each weapon. They were given information about the features of each weapon, but no opinions about them. They were asked not to discuss their opinions with any other test subject until they had finished shooting all weapons and reported their opinions to FTU personnel. Their opinions were to be based on

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trigger feel, recoil management, features and controls, grip comfort, sights and reliability.

- 7) The research aspect of testing was started, gathering information about the weapons from agencies currently carrying these weapons. This research will continue and will be included in the final report.

Observations:

Accuracy:

All weapons tested exhibited similar and acceptable accuracy.

Reliability:

1000 rounds were fired through each of the weapons in phase 1. All of the weapons experienced one common event, a failure to lock open on an empty magazine. This is generally caused by the shooter's thumb holding the slide stop down during firing. A proper shooting grip combined with a large slide stop typically causes this issue. The Sig pistols and the Glock 35 experienced this issue the most with several shooters experiencing the issue. It was a rare event on the weapons with a smaller, more protected, slide stop such as the FN FNS, the Springfield XDM and the S&W M&P. A few shooters accounted for the only events of failure to lock open on the FNS, the XDM and the M&P. This can be most likely be attributed to an individual shooter's grip as those shooters tended to experience this issue on each weapon they shot. Other than this minor issue, additional reliability issues experienced by each model are:

Sig Sauer P226: No other issues

Sig Sauer P229: No other issues

Sig Sauer P320: The P320 also locked open during firing on a loaded magazine. Again, this issue relates to the shooter's hand engaging the slide stop during firing. While the failure to lock open on an empty magazine is not a critical issue, the locking open on a loaded magazine is. The P320 utilizes a pre-assembled firing control chassis, and the slide stop cannot be replaced with a smaller one. It could however be individually modified. No other malfunctions were experienced.

FN FNS40 Longslide: No other issues

Glock 35: The G35 also locked open during firing on a loaded magazine. As with the Sig P320 this is a significant issue, but in the case of the Glock, it can be ordered with a smaller slide stop which should minimize or eliminate this issue. The G35 also had several instances where a magazine would not drop free when ejected.

Smith & Wesson M&P: The only reported issue with the M&P was that the slide frequently closed upon the insertion of a loaded magazine. The only issue with this is that it was not consistent. In other words, under stress and officer would either rack the

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slide and load a round, or rack the slide and eject one round while loading another depending on what the weapon did when the magazine was inserted.

Springfield Armory XDM: The only other issue with the XDM was during one handed shooting. With a less than an ideal grip, the grip safety may not be depressed enough to allow the weapon to fire. This issue should be considered a major problem for law enforcement use. Officers may have to fire from awkward positions due to the circumstances or injury, and their weapon has to be able to fire under those conditions.

Muzzle rise/recoil management:

Recoil is the physical result of the projectile leaving the weapon. There is little that can be done to reduce recoil. The shooters perception of recoil is partially related to muzzle rise. Muzzle rise is actually the result of recoil pushing rearward on the weapon after firing. Recoil acts rearward along the axis of the barrel. Since the barrel, or bore, is above the shooter's hand, as the weapon is pushed back into the shooter's hand it rotates upward. The closer the shooter's hand is to the axis of the bore, the less muzzle rise the shooter experiences. While this is somewhat subjective, shooters consistently reported the Sig Sauer pistols and the Springfield Armory XDM to have more muzzle rise than the other offerings. Muzzle rise slows the shooter's recovery time to the next shot, and increases the shooters perceived recoil. This result is consistent with a physical examination of the pistols. The Sig Sauer pistols all have a lower grip than the others. The XDM has the appearance of a higher grip, but it has a tall slide with the barrel mounted high in the slide.

Features and Controls:

This category is also somewhat subjective, and while there was some variation in what features were preferred, there were some consistencies. All shooters preferred the striker fired system to the double/single action of the Sig P226 and P229. Most shooters appreciated ambidextrous controls. Most shooters also liked the beveled magazine well on the FNS. Most did not like the grip safety on the Springfield XDM. Most preferred the metal magazines to the polymer clad magazines of the Glock.

Recommendations:

Each shooter gave their preferences individually considering their experience with weapons, the shooting they did with these weapons and the features of each. While it is expected that their previous experience with some of these weapons is different and that each shooter may use some of that previous experience to make their determinations, there is a surprising level of consistency in the results of their preferences.

All shooters were very familiar with the Sig P229 and P226. Most were familiar with the Glock and the Smith & Wesson. In general they were least familiar with the FNS, the P320 and the XDM.

Even though they were less familiar with the FNS before shooting it, 50% of all of these experienced shooters chose it as their first choice for a duty pistol. 40% selected the Glock 35 as

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their first choice. The Sig Sauer P320 and the S&W M&P each had 5% select it as their first choice. The FN FNS and the Glock 35 were the clear favorites. 90% of shooters put the FN in either first or second place while 55% did so with the Glock. The S&W M&P was selected in first or second by 35% of shooters.

Most importantly, none of the shooters in this test group chose the Sig Sauer P229 or P226 as their first or second choice. This does not mean that these shooters felt the current duty pistols are not good quality handguns, it just shows that they feel there are some other options that may be better. In large part this is due to the trigger system, but magazine capacity and ergonomics also play a part.

Considering the data collected I recommend the following:

Testing with the Springfield Armory XDM should be discontinued. The grip safety offers no real advantages, and creates a potential problem for an injured officer. In addition, this weapon was not preferred by the test group.

Testing with the Sig P320 should be discontinued. While this weapon may be acceptable as a duty weapon, the test group found that several of the other test weapons were better options. In addition to this, Safariland does not currently manufacture the ALS or SLS duty holsters for this weapon with a light attached.

Testing should continue with the following weapons:

- a) The FN FNS 40 Longslide was well liked by most shooters and was the most selected of the test group despite starting as one of the least known.
- b) The Glock 35 Gen 4 was also well liked by most shooters and it has an established track record as a police handgun.
- c) The Smith & Wesson M&P 40L was not as well liked as the FN or the Glock, but it performed well and was the third choice on average.

All of these weapons were selected by the test group as being potentially better options than our current duty weapons. Again, the testing is not complete and this is not an indication that these weapons are superior. The next two phases will subject these weapons to more rigorous testing that will help determine their durability and reliability. Furthermore, phase 2 will specifically address whether these weapons will beneficially affect struggling shooters abilities.

Given these results, there is a valid reason to continue testing with the indicated weapons. The second phase of testing will require that four more of each weapon be purchased. The present cost of this purchase would be about \$6,000. There are enough available funds in the FTU budget to cover this expense. Even if these weapons are not selected they will become part of a future trade for ammunition and part of this cost will be recovered.

Handgun testing procedures

The testing of striker-fired primary handgun options will be conducted in three phases. Our current Sig Sauer P226 and P229 will also be fired alongside the test guns as a baseline.

Phase 1:

Conducted by FTU personnel utilizing one example of each test weapon:

(1000 rounds per gun)

- 1) Each handgun will be cleaned to remove any packing grease applied by the manufacturer.
- 2) "Break in" will be performed with each gun by firing 250 rounds of practice ammunition through it. (accuracy and reliability will not be measured during the break-in)
- 3) The weapons will then be cleaned and lubricated.
- 4) Tests of accuracy and muzzle velocity will be conducted after break-in. The goal is not necessarily to determine which handgun is the most accurate, but that each handgun is acceptably accurate.
- 5) Research will be done by contacting agencies similar in size to DPS that currently carry these pistols. The information obtained about safety, reliability, manufacturer support, and training issues will be documented in the final report.

(Following phase 1, FTU will make a presentation to the Training chain of command up to the Major. If there is reason to believe that at least one of the test guns is a viable option, testing will continue with the weapons deemed viable with the approval of the Training Commander. At this point if the testing is to continue, 4 more of each model to be tested will be purchased.

Phase 2:

Conducted by selected personnel from all divisions of various skill levels; representing a cross-section of DPS personnel from around the state:

This phase will utilize 50 shooters that will represent about 5% of the department's sworn staff. The time requirements will be minimal (about 2 to 4 hours).

(5000 rounds per gun)

- 1) Each shooter will shoot 100 rounds through each pistol noting any malfunctions, mechanical failures, or shooter induced failures to operate.
- 2) Accuracy and weapon handling testing (such as qualifications) will be conducted with the officer's current issued pistol and each of the test guns. The results will be documented by FTU.
- 3) Participants will complete a questionnaire outlining their preferences based on ergonomics, sights, ability to shoot well and their experience comparing the weapons.

- 4) Tests of accuracy and muzzle velocity will be performed at the end of phase 2 to measure continued acceptable accuracy and barrel life

(Following phase 2, FTU will make a presentation to the Training chain of command up to the Major. At this point, conclusions about which weapons will be approved for personally owned on-duty use may be made and submitted for approval by Executive Staff. If there is reason to believe that at least one of the test guns is a viable option for department issue, testing will continue with up to two of the test weapons with the approval of the Major. At this point if the testing is to continue, 20 more of each model to be tested will be purchased.

Phase 3:

Conducted by selected personnel from all divisions of various skill levels; representing a cross-section of DPS personnel from around the state:

This phase will utilize 40 officers of varied skill level. These Officers will need to be open minded and have good documentation skills. Weapons entering Phase 3 will already have proven to be reliable.

- 1) Field testing will be conducted. Selected officers will be issued a test pistol as their duty weapon. They will complete a log of rounds fired and any malfunctions, maintenance issues, and personal comments about the viability of the weapon as compared to our current pistol.

Following the test sequence;

FTU staff will prepare a comprehensive report for executive staff detailing the findings and any recommendations made as a result of the testing. Recommendations will be based on the following:

- 1) Research conducted by FTU relating to reliability, customer service, armoring issues and the availability of weapons and parts
- 2) Accuracy and reliability data collected during the testing process.
- 3) Test evaluator recommendations based on ergonomics or "feel" and shootability.
- 4) Determinations as to whether any of the weapons offer training advantages over our current weapons increasing officer's abilities in this high-liability area.

Sgt Jason Leonard #5558

Date

AZ DPS Firearms Training Unit

User notes for FNS 9L SN GKU0115708 issued to Trooper R. VanKeuren #5301

This weapon will be maintained on a normal maintenance schedule of cleaning and lubrication at the end of shooting cycles. Standard, full synthetic lubricant and MPro 7 cleaner will be utilized.

One malfunction noted on 07-18-2016. The slide stop locked the slide with two rounds left on the chamber. I attribute this to shooter error. I was operating the weapon support side hand and intentionally holding with a loose grip. I believe my thumb triggered the stoppage. It is noted that expelled brass appears to have soot on one side of the outside of the expelled casings. It is further noted that soot is observed on the front section of the magazines. (this was not observed in earlier 2014 versions of the FNS9L) 115 and 124 ball ammunition was tested for function 147 GDHPs were also tested for function. No malfunctions were noted.

On 07-19-2016, I completed the AZPOST AZDPS primary handgun weapon qualification. A score of 250 was obtained. It should be noted that the weapon was faster to handle with recovery times between shots faster than the 40L.

As of 07-20-2016 I have experienced no feeding or extracting malfunctions with the weapon. No appreciable wear has been noted on the weapon and still bears factory Parkerizing with little to no wear. The weapon is point of aim, point of impact for targets up to 100 yards. No difference in size, trigger press or operation is noted from the FNS 40L to the FNS 9L. Muzzle flip is considerably less with follow up shots being placed on target faster.

Have shot over 1,000 rounds of 124 grain ball ammo through without cleaning and just standard lubrication from the beginning of the shooting cycle. No malfunctions noted or observed. No noticeable change in trigger poundage or smoothness. No changes in accuracy. Upon cleaning and routine service, no change in wear patterns within the pistol.

Have been carrying the pistol daily for wear testing since 08-15-2016. In and out of vehicle, normal daily duties to include range duties. Weapon functions within the same tolerances as the FNS40L. Pistol function is not affected by dust or lint.

During Trooper Shooter Development days, have had other troopers shoot this particular pistol. Comments are positive in nature. The feel, weight, and trigger press are identical in nature to its 40 caliber brother with one distinct difference. Felt recoil/muzzle flip impulse. The weapon is much easier and faster to bring back on target to facilitate additional accurate shots.

I have received samples of Winchester Ranger 147 grain bonded hollow points and 124 grain Plus P bonded hollow points from the manufacturer for testing and evaluating. Both the 124 and 147 grain bullets functioned normally and without malfunction for 200 round. The use and testing of this ammunition was based on several factors. First, to test the reliability of the pistol with various styles of ammunition profiles and loads. Second, to test the feasibility of the ammunition for possible use or issue in the future. FTU is planning on testing additional options for duty ammunition in the event of procurement or manufacturing problems or delays. This will be forthcoming. The Winchester Ranger ammunition functioned correctly and reliability within the FNS9L.

In conclusion, I believe that the FNH FNS9L is a viable weapons platform that the Department should consider for authorization for a primary duty pistol. From an armorer's standpoint, the

weapon is identical in design to the FNS40L. No additional training or techniques need to be taught in the annual maintenance or evaluation of this weapon. The pistol functions identically from the 40 caliber to the 9mm. The dimensions of the pistol are similar enough as not to require a separate holster or magazine configuration.

The debate as to which calibers are better for police work (45, 40 or 9mm) with today's technology concerning the construction of bullets is moot. On April 21, 2016, the Firearms Training Unit hosted an ammunition demonstration with the assistance of San Diego Police Supply. During the demonstration, various weapons styles and calibers were shot into ballistic gelatin through various media. The bullets utilized were current issue Speer Gold Dot ammunition and improved Speer "G2" Gold dot ammunition. These demonstrations showed that the difference in penetration and bullet performance was negligible from caliber to caliber. Furthermore, performance of the bullets into objects such as vehicles was similar from caliber to caliber. (not withstanding obvious differences in velocity and penetration between rifle and pistol caliber and platforms)

Keeping the before in mind, I believe the authorization of the FNS9L can provide a benefit or an advantage to the Department and its Troopers. Troopers carrying a 9mm platform will have on average 9 additional rounds of ammunition on their person with a standard loadout of three magazines. In a longer term gunfight/active shooter scenario, the additional rounds can be the difference between life and death. For Troopers stationed in remote areas where it is normal to have extended ETA's for back up, having additional ammunition can make all of the difference.

The pistol has a noticeable reduction in muzzle flip. This can be evaluated in several different ways. As an instructor, having a platform that offers reduced muzzle flip can assist shooters who are sensitive to recoil or diminutive in stature. For shooters that excel with weapons, the reduced recoil translates into faster recovery between shots and more shots faster on target. Winning a gunfight is based on the principle of; First, Fastest, Fatal, Frequent. I believe that the advantages of the FNS9L will assist in this mantra. As the procurement Trooper for the Firearms training unit, the acquisition of 9mm ammo can be easier. The ammo is readily available from many manufacturers and large quantity of military surplus ammunition is available and cheaper prices. In the long term, this translates into potential budget savings for the agency.